

## Some Unsolved Problems, Questions, and Applications of the Brightsen Nucleon Cluster Model

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Brightsen Model is opposite to the Standard Model, and it was build on John Weeler's Resonating Group Structure Model and on Linus Pauling's Close-Packed Spheron Model. Among Brightsen Model's predictions and applications we cite the fact that it derives the average number of prompt neutrons per fission event, it provides a theoretical way for understanding the low temperature / low energy reactions and for approaching the artificially induced fission, it predicts that forces within nucleon clusters are stronger than forces between such clusters within isotopes; it predicts the unmatter entities inside nuclei that result from stable and neutral union of matter and antimatter, and so on. But these predictions have to be tested in the future at the new CERN laboratory.

According to the Brightsen Nucleon Cluster Model [1] all nuclides of beta stable isotopes can be described by three fundamental nucleon clusters (NPN, PNP, NP), with halo clusters (NN, PP, NNN) now experimentally observed. The Brightsen model builds on the early cluster models of the Resonating Group Structure of John Wheeler [2] and the Linus Pauling Close-Packed Spheron Model [3], which predict mathematically that the wave function of a composite nucleus can be viewed quantum mechanically as a combination of partial wave functions that correspond to the multiple ways nucleons (protons, neutrons) can be distributed into close-packed clusters, thus rejecting the standard model Hartree-Fock formalism of average field interactions between independent nucleons in nuclear shells. Presented in this section are a number of unsolved problems, questions, and future experimental pathways based on the Brightsen Nucleon Cluster Model formalism—many additional applications can be gleamed from careful study of the literature cited in the references provided:

1. The Brightsen Model derives the average number of prompt neutrons per fission event for many radioactive isotopes of human importance (U-235, U-233, Pu-239, Pu-241) as well as emission of light charged particles, suggesting that all modes of fission derive from a four step process [4]. Further study of these claims are warranted given the importance of understanding the fission of radioactive isotopes for energy production.
2. The Brightsen Model provides a theoretical pathway for experimentalists to understand the numerous laboratory results of low temperature transformation/low energy reactions, such as the well studied  $^{104}\text{Pd} (p, \alpha) ^{101}\text{Rh}$  reaction [5]. Application of the Brightsen Model to low energy fusion reactions as a possible result of interactions between nucleon clusters is of fundamental importance to human energy demands.
3. The Brightsen Model predicts the existence of “unmatter entities” inside nuclei [6], which result from stable

and neutral union of matter and antimatter nucleon clusters. As a result, the Brightsen Model predicts that antimatter has corresponding antigravity effects [7]. This prediction can be tested in the future at CERN beginning 2008 using antihydrogen. Once accurate measurements can be made of the gravitational acceleration of antihydrogen, and the results compared with matter hydrogen, if the two forms have opposite acceleration, then a major prediction of the Brightsen Model will be confirmed (e.g., that antimatter has both anti-gravity effect and anti-mass). If experimentally confirmed, then predictive equations will need to be developed using the Brightsen Model formalism of union of matter and antimatter clusters (e.g., the unsolved mathematical formation of unmatter entities inside nuclei). The importance of this aspect of the Brightsen Model links to the current problem in physics of the missing matter of the universe and possible unification of gravity at relativistic (macroscopic) and quantum (microscopic) states.

4. The Brightsen Model offers a theoretical approach for artificially induced fission of dangerous radioactive nuclei to produce relatively stable elements [5]. In theory, if externally produced electromagnetic radiation can be caused to resonate with the exact magnetic moment of a specific sub-nuclear nucleon cluster (e.g., NPN, PNP, NP nucleon clusters), than an individual nucleon cluster can in theory be excited to a energy such that it is expelled from the nucleus, resulting in transmutation of the parent isotope via fission and/or beta or alpha decay to less radioactive daughter structures. The applications of this process for nuclear energy production are clear and worthy of experimental test.

5. The Brightsen Model predicts that one sub-cluster isodine [5] of the very stable Helium-4 isotope consists of two weakly stable deuteron [NP] clusters, each with their own distinct energy level, spin, magnetic moment, etc. Experimental tests are needed to confirm this fundamental model prediction. If confirmed, new physics mathematical description of shell structure of isotopes would follow.

6. The Brightsen Model predicts that forces “within” nucleon clusters (NPN,PNP,NP) are stronger than forces “between” such clusters within isotopes, a result of different combinations of the spin doublet and triplet clusters. It is predicted that research here would result in new measurable macroscopic properties of atomic nuclei including new fundamental force interactions.

7. The Brightsen Model predicts that the next “magic number” will be found at  $N = 172$ ,  $Z = 106$ ,  $A = 278$  (Seaborgium-278). Experimental confirmation of this prediction would require a revised explanation of magic numbers in isotopes based on nucleon clusters as the fundamental building blocks of shell structure in atomic nuclei, as opposed to independent nucleons in an average field.

8. The Brightsen Model predicts that the large cross section of Boron-10 (as opposed to the small cross section of Boron-11) results from the presence of a stable and independent nucleon cluster structure [PNP], which coexists with two [NP] and one [NPN] clusters that maintain very small cross sections. Thus the vast majority of the cross section dynamics of Boron-10 is predicted by the Brightsen Model to derive from a strongly interacting [PNP] cluster. This four cluster formalism for Boron-10 (e.g., 1PNP, 2NP, 1NPN) also correctly derives the  $I = 3$  spin experimentally observed.

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## References

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